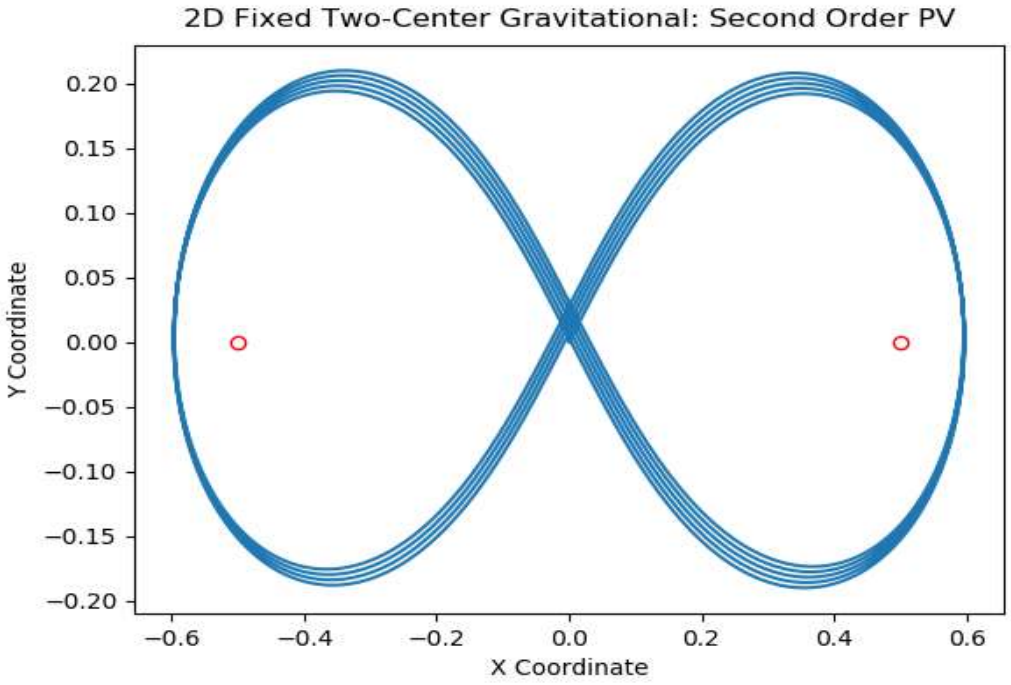
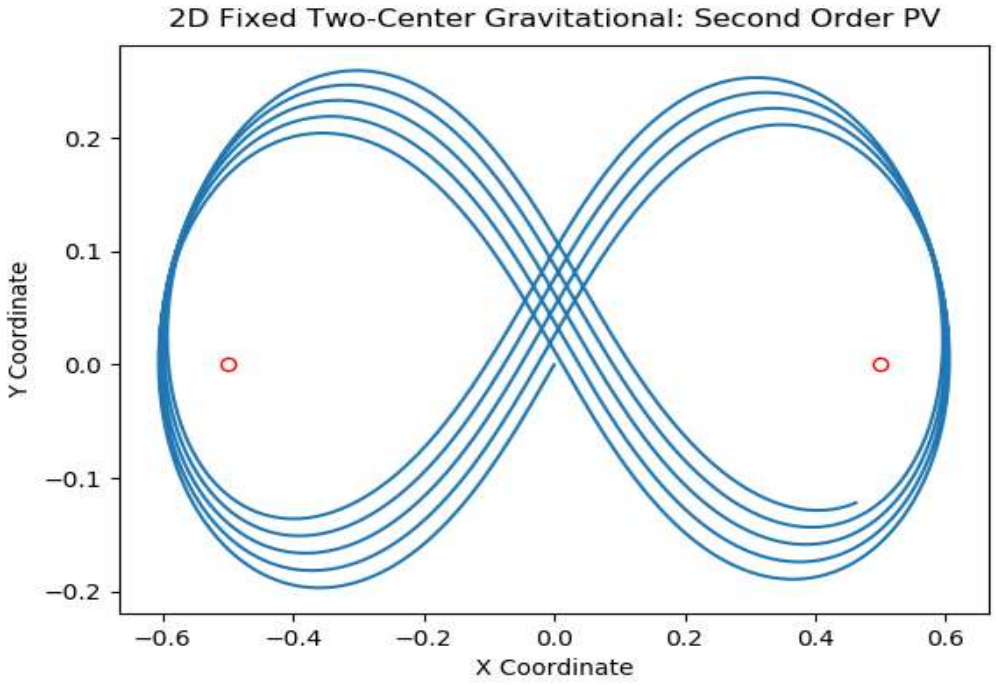
Problem 1:

For a projectile fired from $\vec{r}=(0,0)$ with velocity $\vec{v}=(1,45^\circ)$

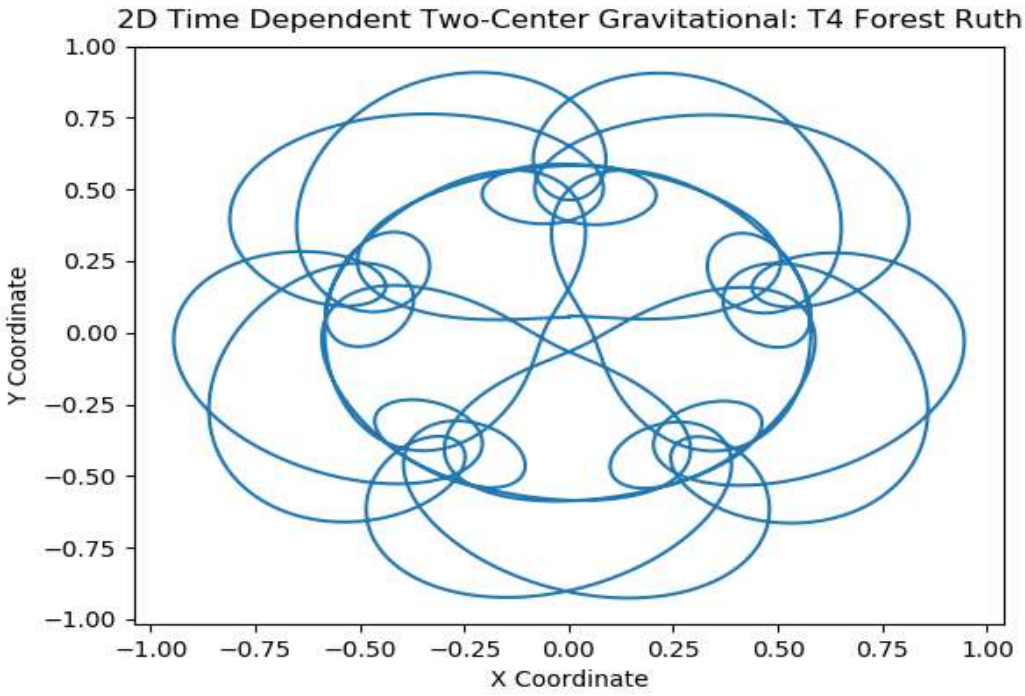


For a projectile fired from $\vec{r}=(0,0)$ with velocity $\vec{v}=(1.03,225^\circ)$

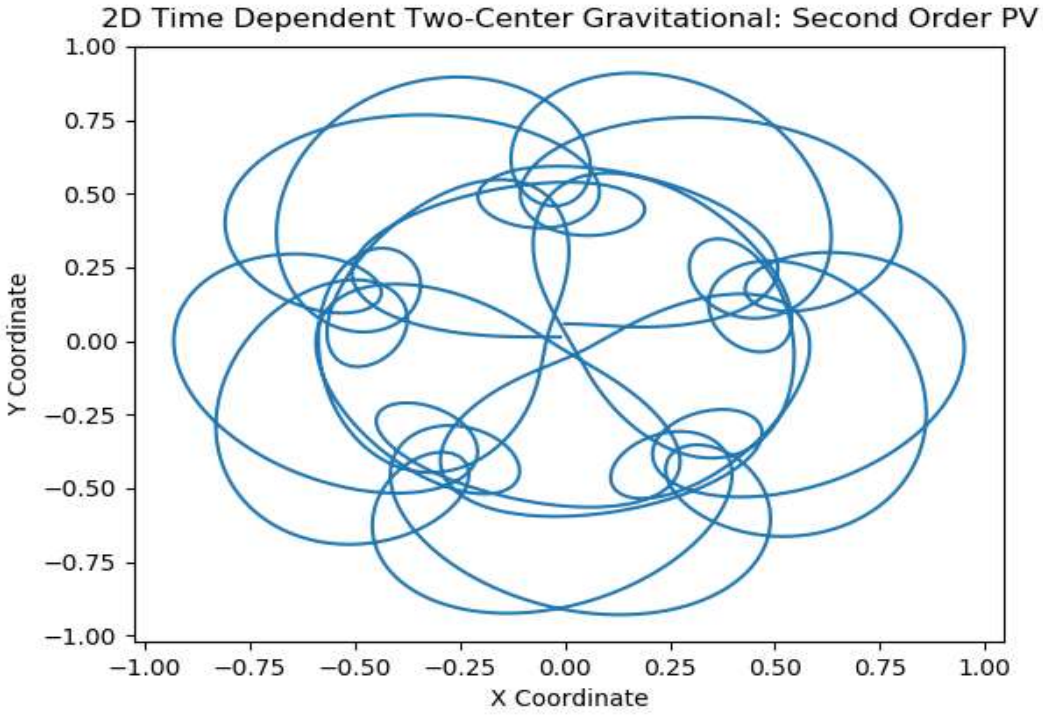


Problem 4:

Implementing the fourth order FR algorithm with $\vec{r}_0=(0,0.058)$ and velocity $\vec{v}_0=(0.49,0)$ for the restricted three-body problem, we find:

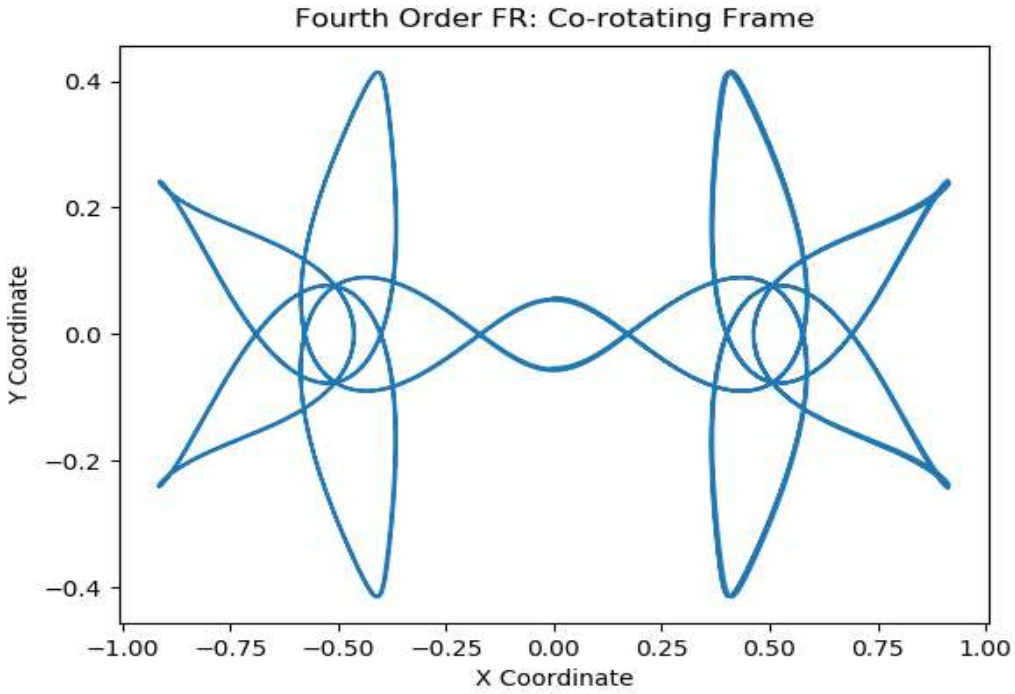


For the second-order Position-Verlet algorithm, using the same initial conditions, we find:



Problem 5:

In the co-rotating frame, our FR algorithm is presented as follows:



Choosing $\vec{r}_0=(0.02, 0.058)$ and velocity $\vec{v}_0=(0.46, 0.02)$ as our new initial conditions in an attempt to witness chaotic behavior reveals the following in the co-rotating frame: